

WHAT IS CLAIMED IS:

1. A picture information conversion apparatus for converting the resolution of the compressed picture information obtained on discrete cosine converting a picture in terms of a macroblock made up of eight coefficients for both the horizontal and vertical directions, as a unit, said apparatus comprising:

decoding means for decoding an interlaced picture using only four coefficients for both the horizontal and vertical directions of the macroblock making up the input compressed picture information obtained on encoding the interlaced picture;

scanning conversion means for selecting a first field or a second field of the interlaced picture decoded by said decoding means for generating a progressive-scanned picture;

decimating means for decimating the picture generated by said scanning conversion means in the horizontal direction; and

encoding means for encoding a picture decimated by said decimating means to the output picture information lower in resolution than said input picture.

2. The picture information conversion apparatus according to claim 1 wherein said input compressed picture information is by the MPEG2 standard and wherein said output compressed picture information is by the MPEG2 4 standard.

3. The picture information conversion apparatus according to claim 1 wherein said decimating means performs 1/2 downsampling in the horizontal direction of said picture and wherein said output compressed picture information has the resolution of

1/4 for both the horizontal and vertical directions with respect to said input compressed picture information.

4. The picture information conversion apparatus according to claim 4 wherein said input compressed picture information is made up of an intra-coded picture, encoded in a frame, a forward predictive-coded picture, obtained on inter-frame predictive coding by referencing another picture in the forward direction, and an inter-frame bi-directionally predictive-coded picture, obtained on inter-frame predictive coding by referencing other pictures in both the forward and backward directions, there being provided discriminating means for deciphering the type of the encoded picture constituting the input compressed picture information for allowing passage therethrough of the intra-coded picture and the forward predictive-coded picture but discarding the bi-directionally predictive-coded picture, said decoding means being fed with the compressed picture information through said discriminating means.

5. The picture information conversion apparatus according to claim 4 wherein said decoding means decodes only intra-coded and forward predictive-coded pictures.

6. The picture information conversion apparatus according to claim 1 wherein said input compressed picture information has been variable-length coded;

said decoding means including variable length decoding means for variable-length decoding the compressed picture information and IDCT means for inverse discrete cosine converting the compressed picture information variable-length decoded by said variable length decoding means, said variable length decoding means variable-

length decoding only DCT coefficients necessary for IDCT in said IDCT means depending on whether a macroblock forming said input compressed picture information is the field mode or the frame mode.

7. The picture information conversion apparatus according to claim 6 wherein said IDCT means is associated with the field mode and applies IDCT to DCT coefficients of four horizontal and vertical low-range coefficients of eight horizontal and vertical DCT coefficients making up said macroblock.

8. The picture information conversion apparatus according to claim 6 wherein said IDCT executes processing operations using a pre-set fast algorithm.

9. The picture information conversion apparatus according to claim 6 wherein said IDCT means is associated with the frame mode and applies IDCT to DCT coefficients of four horizontal low-range coefficients of the eight horizontal and vertical DCT coefficients making up said macroblock, said IDCT means applying field separation IDCT to DCT coefficients of four vertical low-range coefficients of the eight horizontal and vertical DCT coefficients

10. The picture information conversion apparatus according to claim 9 wherein said IDCT executes processing operations using a pre-set fast algorithm.

11. The picture information conversion apparatus according to claim 9 wherein said IDCT means executes IDCT on four horizontal and vertical DCT coefficients of four horizontal and eight vertical DCT coefficients and also using four horizontal low-range coefficients and two vertical DCT coefficients consecutive vertically to said four low-

range horizontal and vertical low-range coefficients, with the remaining coefficients being set to 0.

12. The picture information conversion apparatus according to claim 1 wherein said input compressed picture information has been motion-compensated using a motion vector, said decoding means including motion compensation means for motion-compensating a picture using motion vector, said motion compensation means executing interpolation to 1/4 pixel precision for both the horizontal and vertical directions based on the motion vector of said input compressed picture information.

13. The picture information conversion apparatus according to claim 12 wherein said motion compensation means executes interpolation in the horizontal direction to 1/2 pixel precision, using a double-interpolation digital filter, said motion compensation means executing interpolation to 1/4 pixel precision by linear interpolation.

14. The picture information conversion apparatus according to claim 12 wherein said motion compensation means executes interpolation in the horizontal direction on said macroblock in a frame mode to 1/2 pixel precision, using a double interpolation digital filter, said motion compensation means also executing intra-field interpolation to 1/4 pixel precision by linear interpolation.

15. The picture information conversion apparatus according to claim 12 wherein said motion compensation means executes interpolation in the vertical direction on said macroblock in a frame mode to 1/2 pixel precision, using a double interpolation digital filter, said motion compensation means also executing intra-field interpolation to 1/4

pixel precision by linear interpolation.

16. The picture information conversion apparatus according to claim 12 wherein said digital filter is a half-band filter.

17. The picture information conversion apparatus according to claim 16 wherein said digital filter previously calculates coefficients equivalent to a series of interpolation operations to apply said coefficients directly to pixel values depending on values of the motion vector of a macroblock of said input compressed picture information.

18. The picture information conversion apparatus according to claim 12 wherein said motion compensation means virtually creates, for pixels lying outside a picture frame of a picture forming said input compressed picture information required for effecting double interpolation filtering, pixels as necessary outside said picture frame of said picture, by way of a filtering processing operation.

19. The picture information conversion apparatus according to claim 18 wherein said motion compensation means mirrors pre-existing pixels at a pre-set location of an array of said pixels, elongates said array of the pre-existing pixels or uses pre-set values to create necessary pixels outside said picture frame.

20. The picture information conversion apparatus according to claim 1 wherein said scanning conversion means selects one of the first and second fields of an interlaced picture decoded by said decoding means to convert an interlaced picture having 1/2 resolution for both the horizontal and vertical directions with respect to said input compressed picture information to a progressively-scanned picture having a resolution

of $1/2$ in the horizontal direction and a resolution of $1/4$ in the vertical direction with respect to said input compressed picture information.

21. The picture information conversion apparatus according to claim 20 wherein said scanning conversion means adjusts the number of pixels in the vertical direction so as to cope with macroblock-accommodating processing in said encoding means.

22. The picture information conversion apparatus according to claim 1 wherein said decimating means performs $1/2$ downsampling on a progressively-scanned picture of the input compressed picture information from said scanning conversion means, having a resolution of $1/2$ in the horizontal direction and a resolution of $1/4$ in the vertical direction, to output a progressively-scanned picture having a resolution of $1/4$ for both the horizontal and vertical directions of said input compressed picture information.

23. The picture information conversion apparatus according to claim 22 wherein said decimating means performs downsampling using a low-pass filter having several taps.

24. The picture information conversion apparatus according to claim 22 wherein said decimating means adjusts the number of pixels in the horizontal direction so as to enable said encoding means to perform macroblock-based processing.

25. The picture information conversion apparatus according to claim 1 wherein said compressed picture information is made up of an intra-coded picture, obtained on intra-frame coding, an inter-frame forward predictive-coded picture, obtained on predictive-coding by referencing another picture in the forward direction, an inter-

frame bi-directionally predictive-coded picture, obtained on predictive-coding by referencing other pictures in the forward and backward directions, and a splite picture, said encoding means encoding a picture based on said intra-coded picture and said forward predictive-coded picture.

26. The picture information conversion apparatus according to claim 1 wherein said compressed picture information has been motion-compensated by a motion vector, wherein there is provided motion vector synthesis means for synthesizing the motion-compensating vector, the motion vector associated with a picture output from said decimating means being synthesized based on the motion vector of said input compressed picture information, said encoding means performing the encoding based on said motion vector.

27. The picture information conversion apparatus according to claim 26 wherein there is provided motion vector detection means for detecting the motion vector based on a motion vector synthesized by said motion vector synthesizing means.

28. A picture information conversion method for converting the resolution of the compressed picture information obtained on discrete cosine converting a picture in terms of a macroblock made up of eight coefficients for both the horizontal and vertical directions, as a unit, said method comprising:

a decoding step for decoding an interlaced picture using only four coefficients for both the horizontal and vertical directions of the macroblock making up the input compressed picture information obtained on encoding the interlaced picture;

a scanning conversion step for selecting a first field or a second field of the interlaced picture decoded by said decoding step for generating a progressive-scanned picture;

a decimating step for decimating the picture generated by said scanning conversion step in the horizontal direction; and

an encoding step for encoding a picture decimated by said decimating step to the output picture information lower in resolution than said input picture.

29. The picture information conversion method according to claim 28 wherein said input compressed picture information is by the MPEG2 standard and wherein said output compressed picture information is by the MPEG2 4 standard.

30. The picture information conversion method according to claim 28 wherein said decimating step performs 1/2 downsampling in the horizontal direction of said picture and wherein said output compressed picture information has the resolution of 1/4 for both the horizontal and vertical directions with respect to said input compressed picture information.

31. The picture information conversion method according to claim 28 wherein said input compressed picture information is made up of an intra-coded picture, encoded in a frame, a forward predictive-coded picture, obtained on inter-frame predictive coding by referencing another picture in the forward direction, and an inter-frame bi-directionally predictive-coded picture, obtained on inter-frame predictive coding by referencing other pictures in both the forward and backward directions, there being

provided discriminating step for deciphering the type of the encoded picture forming the input compressed picture information for allowing passage therethrough of the intra-coded picture and the forward predictive-coded picture but discarding the bi-directionally predictive-coded picture, said decoding step being fed with the compressed picture information through said discriminating step.

32. The picture information conversion method according to claim 28 wherein said decoding step decodes only intra-coded and forward predictive-coded pictures.